Validation and Operational QA of L1B

Summary of Validation Activities

(BRIEF DESCRIPTION IN BACK-UP SECTION)

Operational Activities	Characterization Activities	Vicarious Activities
OA-08 SV Port Lunar	CA-01 Reflectance Calibration Trending	VA-01 U of AZ/ Railroad Playa
OA-09SDYawMapping	CA-02SDSNRStudy	VA-02 NOAA/MOBY
OA-10 RVS Cold Space Maneuver	CA-03 Temperature Sensitivity of SD Observations	VA-03 DOE/ARM
OA-14 Cavity Mapping w/Sector Rotation	CA-04 Band 7 SD BRF	VA-04 Oceans Team/Validation Cruises
OA-17 RVS Stability Monitoring via Sector Rotation	CA-05 SDSM Charged Particle Effects	VA-05 U Miami/ In-situ Studies, Commercial Cruise Line
OA-18 SDSM Charged Particle Background	CA-06SWIRBandsThermal Leak	VA-06OceanTempBuoy Network
OA-20 SRCA/Diurnal ST Radiometric Stability	CA-07 Establish Space View Moon KOB	VA-07 Antarctica/ RVS

Summary of Validation Activities

(BRIEF DESCRIPTION IN BACK-UP SECTION)

Operational Activities	Characterization Activities	Vicarious Activities
OA-22 SRCA Spectral Response Stability	CA-08 Optical& Spatial Purity Studies	VA-08 NSF/LTER
OA-23,24 SRCA Co-Registration & IFOV Stability	CA-09RSBRVS	VA-09 UCSB/ Railroad Playa
OA-26ThermalBandBB Warmup&Cooldown	CA-10 RSB Destriping	VA-10 U Wisc/HIS
	CA-11 Cloud Edge Transient Response	VA-11 GSFC - Wisc/MAS
	CA-12 Shore Line Transient Response	VA-12 GSFC/ P. Abel
	CA-13 Scene Restoration Studies	VA-13 USGS/Lunar Radiance
	CA-14 TDI Effectiveness	VA-14AVHRR

Summary of Validation Activities

(BRIEF DESCRIPTION IN BACK-UP SECTION)

Operational Activities	Characterization Activities	Vicarious Activities
	CA- 15 Bands 3 1 Cross-talk	VA-15 AATSR
	CA-16 TEB NEdT/SNR Study	VA-16 MISR
	CA- 17 Test Sites Trending	VA-17 ASTER
	CA-18 SDSM Screen Signal Ripple & Vignetting Factor	VA-18 GLI
	CA-19 SD Screen Transmission	VA- 19 MODIS-PM

Validation Activities Summary

- **Operational Activities, Characterization Activities and Vicarious Activities comprise MCST Validation Activities**
- **10 OAs, 19 CAs and 19 VAs mapped into Radiometric, Spectral, Spatial and other validation studies**
- **Polarization validation studies TBD**
- **Detailed schedules and application of Activities by Band TBR**

Radiometric, Characterization Validation Activities

	OA	CA	VA
RSB Reflectance/	9	1	1
Radiance	14	2	2
	18	3	3
	20	4	4
		7	5
		9	8
		10	11
		14	12
		17	13
		18	14
		19	16
			18
			19
TEB Radiance	10	9	6
	14	10	7
	17	15	9
	26	16	10
		17	14
			15
			17
			18
			19

RSB Stability and Spectral Spatial Validation Activities

	OA	CA	VA
RSB Response	8		19
Stability			
Spectral In-Band	22		
Spectral Out-		6	
of-band		15	
Spatial/PSFs	8	12	
		13	
Spatial IFOVs	23		
	24		
Spatial/Co-	23	12	
Registration	24		

Miscellaneous Validation Activities

	OA	CA	VA
OTHERS			
Transient Response		**11**	
		12	
		13	
		19	
LiB Space View		**7**	
Port LUT			
Residual Electrical	**26**		
Cross-talk			
Residual Optical	**26**	**6**	
Cross-talk/Ghosting		**8**	
		15	
Polarization			

Validation with Vicarious Activities

- **What is next**
  - Need specifics
    - **What spectral bands, spatial resolution footprints, units**
    - **Accurate transfer to Top-of-Atmosphere**
    - **Calibration traceability (radiance/reflectance)**
    - **Uncertainties**
    - **Identify unmet requirements**
    - **Control of observation dependent biases**
    - **Screen candidates for effectiveness and relevance**
  - Develop coordinated plans

Calibration Validation Workshops

- **Consensus for calibration changes developed through Workshop interactions**
- **Objective to understand impact of calibration changes to Level 2 products**
- **Test proposed changes with actual data**
- **CAATS used to provide test scenes to L2 developers**
  - Use L2 developers recommended test scenes
- **Goal: first meeting soon after 90 days of Earth View data availability**

Calibration -Applicable Archival Test Scenes (CAATS)

- **This is a Post-launch Calibration Validation Workshop strategy for L1B validation and improvements**
  - Minimize surprises to L2 products from updates to L1B
  - User Groups requested to identify selected scenes to test candidate calibration improvements
  - Frequently these will be scenes associated with ground truth
- **Workshops would be held about twice yearly**
- **Test scenes for this purpose are being called CAATS**
  - MCST (w/DAAC, SDST help?) would send out CAATS processed L1B files with candidate calibration improvements for L2 developers to review in advance of each workshop

Operational Quality Assurance

Section Divider

Converting Radiometric Uncertainty Results into 4 bit Scaling Index

RadUncert returns floating point values. We want to pack this value into a 4 bit index that is related to the specified uncertainty values for the TEB bands.

$2^4 = 16$ That is an index that ranges from 0....15

We will do this with an exponential scaling function of the form:

$$\frac{u}{su} := e^{\frac{i}{scf}}$$

Where u = radiance uncertainty, su = specified uncertainty and scf = scaling factor

Then the scaling Index value, i, will be:

$$i := scf \cdot \ln\left(\frac{u}{su}\right)$$

Since, i, must be an integer value, we take the floor function value of i, then:

$$Index := \text{floor}\left(scf \cdot \ln\left(\frac{u}{su}\right)\right)$$

Note: We will set i = 15 for all uncertainties greater than the maximum uncertainty for i = 14

L1B 4-bit Uncertainty Index versus Radiance Uncertainty for Band 20

For Band 20 Specified Uncertainty= 0.75 (%)

Index Value	for scf = 3 Uncertainty varies From	To	for scf = 5 Uncertainty varies From	To	for scf = 7 Uncertainty varies From	To
0	0.00	0.75	0.00	0.75	0.00	0.75
1	0.75	1.05	0.75	0.92	0.75	0.87
2	1.05	1.46	0.92	1.12	0.87	1.00
3	1.46	2.04	1.12	1.37	1.00	1.15
4	2.04	2.85	1.37	1.67	1.15	1.33
5	2.85	3.97	1.67	2.04	1.33	1.53
6	3.97	5.54	2.04	2.49	1.53	1.77
7	5.54	7.73	2.49	3.04	1.77	2.04
8	7.73	10.79	3.04	3.71	2.04	2.35
9	10.79	15.06	3.71	4.54	2.35	2.71
10	15.06	21.02	4.54	5.54	2.71	3.13
11	21.02	29.34	5.54	6.77	3.13	3.61
12	29.34	40.95	6.77	8.27	3.61	4.16
13	40.95	57.15	8.27	10.10	4.16	4.80
14	57.15	79.76	10.10	12.33	4.80	5.54
15	79.76	Inf.	12.33	Inf.	5.54	Inf.

Where:
Uncertantity = Specified Uncertantity x exp(Index value/scale factor)
Index = floor function (scale factor x ln(uncertainty/specificed uncertainty))

L1B 4-bit Uncertainty Index versus Radiance Uncertainty for Bands 31-32

For Bands 31 and 32 Specified Uncertainty = 0.50 (%)

Index Value	for scf = 3 Uncertainty varies From	To	for scf = 5 Uncertainty varies From	To	for scf = 7 Uncertainty varies From	To
0	0.50	0.70	0.50	0.61	0.50	0.58
1	0.70	0.97	0.61	0.75	0.58	0.67
2	0.97	1.36	0.75	0.91	0.67	0.77
3	1.36	1.90	0.91	1.11	0.77	0.89
4	1.90	2.65	1.11	1.36	0.89	1.02
5	2.65	3.69	1.36	1.66	1.02	1.18
6	3.69	5.16	1.66	2.03	1.18	1.36
7	5.16	7.20	2.03	2.48	1.36	1.57
8	7.20	10.04	2.48	3.02	1.57	1.81
9	10.04	14.02	3.02	3.69	1.81	2.09
10	14.02	19.56	3.69	4.51	2.09	2.41
11	19.56	27.30	4.51	5.51	2.41	2.78
12	27.30	38.10	5.51	6.73	2.78	3.20
13	38.10	53.17	6.73	8.22	3.20	3.69
14	53.17	74.21	8.22	10.04	3.69	4.26
15	74.21	Inf.	10.04	Inf.	4.26	Inf.

Where:
Uncertantity = Specified Uncertantity x exp(Index value/scale factor)
Index = floor function (scale factor x ln(uncertainty/specificed uncertainty))

L1B 4-bit Uncertainty Index versus Radiance Uncertainty:Bands 22-30 and 33-36

For Bands 22-30, and 31-36 Specified Uncertainty= 1.00 (%)

Index Value	for scf = 3 Uncertainty varies From	To	for scf = 5 Uncertainty varies From	To	for scf = 7 Uncertainty varies From	To
0	0.00	1.00	0.00	1.00	0.00	1.00
1	1.00	1.40	1.00	1.22	1.00	1.15
2	1.40	1.95	1.22	1.49	1.15	1.33
3	1.95	2.72	1.49	1.82	1.33	1.54
4	2.72	3.79	1.82	2.23	1.54	1.77
5	3.79	5.29	2.23	2.72	1.77	2.04
6	5.29	7.39	2.72	3.32	2.04	2.36
7	7.39	10.31	3.32	4.06	2.36	2.72
8	10.31	14.39	4.06	4.95	2.72	3.14
9	14.39	20.09	4.95	6.05	3.14	3.62
10	20.09	28.03	6.05	7.39	3.62	4.17
11	28.03	39.12	7.39	9.03	4.17	4.81
12	39.12	54.60	9.03	11.02	4.81	5.55
13	54.60	76.20	11.02	13.46	5.55	6.41
14	76.20	106.34	13.46	16.44	6.41	7.39
15	106.34	Inf.	16.44	Inf.	7.39	Inf.

Where:
Uncertantity = Specified Uncertantity x exp(Index value/scale factor)
Index = floor function (scale factor x ln(uncertainty/specificed uncertainty))

L1B 4-bit Uncertainty Index versus Radiance Uncertainty for Band 21

For Band 21 Specified Uncertainty= 10.00 (%)

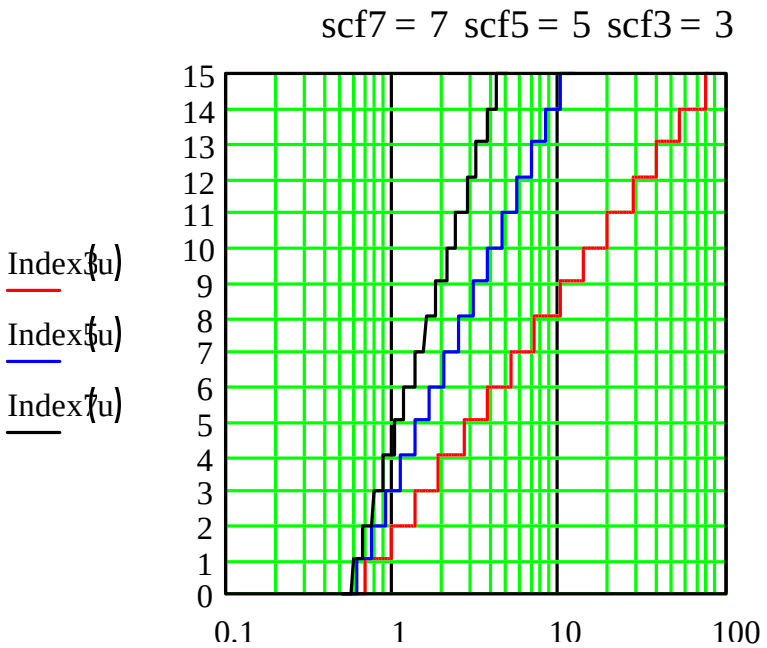
Index Value	for scf = 5 Uncertainty varies From	To	for scf = 7 Uncertainty varies From	To	for scf = 9 Uncertainty varies From	To
0	0.00	10.00	0.00	10.00	0.00	10.00
1	10.00	12.21	10.00	11.54	10.00	11.18
2	12.21	14.92	11.54	13.31	11.18	12.49
3	14.92	18.22	13.31	15.35	12.49	13.96
4	18.22	22.26	15.35	17.71	13.96	15.60
5	22.26	27.18	17.71	20.43	15.60	17.43
6	27.18	33.20	20.43	23.56	17.43	19.48
7	33.20	40.55	23.56	27.18	19.48	21.77
8	40.55	49.53	27.18	31.36	21.77	24.32
9	49.53	60.50	31.36	36.17	24.32	27.18
10	60.50	73.89	36.17	41.73	27.18	30.38
11	73.89	90.25	41.73	48.14	30.38	33.95
12	90.25	110.23	48.14	55.53	33.95	37.94
13	110.23	134.64	55.53	64.05	37.94	42.39
14	134.64	164.45	64.05	73.89	42.39	47.38
15	164.45	Inf.	73.89	Inf.	47.38	Inf.

Where:
Uncertantity = Specified Uncertantity x exp(Index value/scale factor)
Index = floor function (scale factor x ln(uncertainty/specificed uncertainty))

Uncertainty Scaling Index for Bands 31 and 32

For Bands 31 and 32, with

Specified Uncertainty at Ltyp $\delta_{su} = 0.5$ %



1 sigma Uncertainty (%) versus 4 bit scaling index for three scaling factors

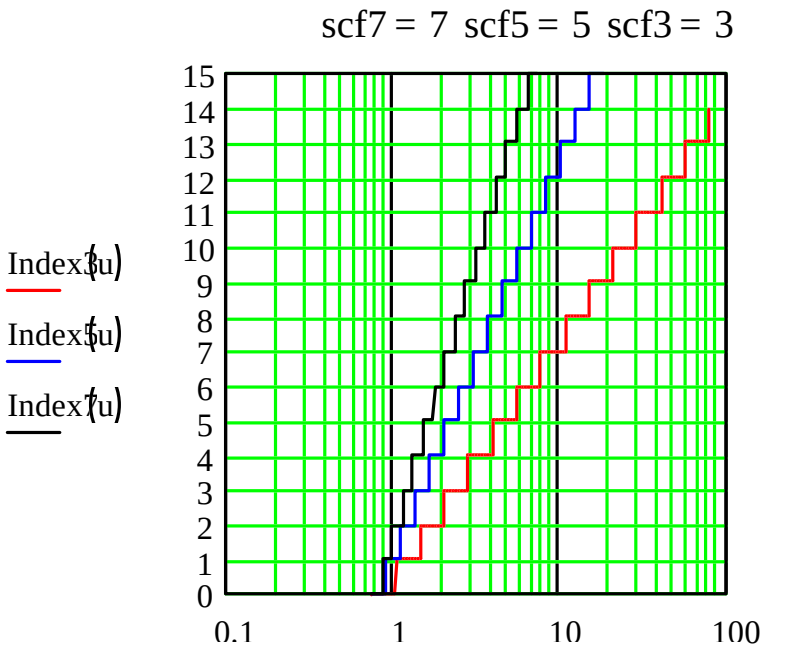
<<<<<<<Fo scf5 = 5 >>>>>>>>

Index Range from		to	Uncertainty Range from	to
l		k	r_l	R_k
0	to	1	0.0	0.61
1	to	2	0.61	0.75
2	to	3	0.75	0.91
3	to	4	0.91	1.11
4	to	5	1.11	1.36
5	to	6	1.36	1.66
6	to	7	1.66	2.03
7	to	8	2.03	2.48
8	to	9	2.48	3.02
9	to	10	3.02	3.69
10	to	11	3.69	4.51
11	to	12	4.51	5.51
12	to	13	5.51	6.73
13	to	14	6.73	8.22
14	to	15	8.22	>8.22

Uncertainty Scaling Index for Band 20

For Bands 20, with

Specified Uncertainty at Ltyp $\delta_{su} = 0.75$ %



1 sigma Uncertainty (%) versus 4 bit scaling index for three scaling factors

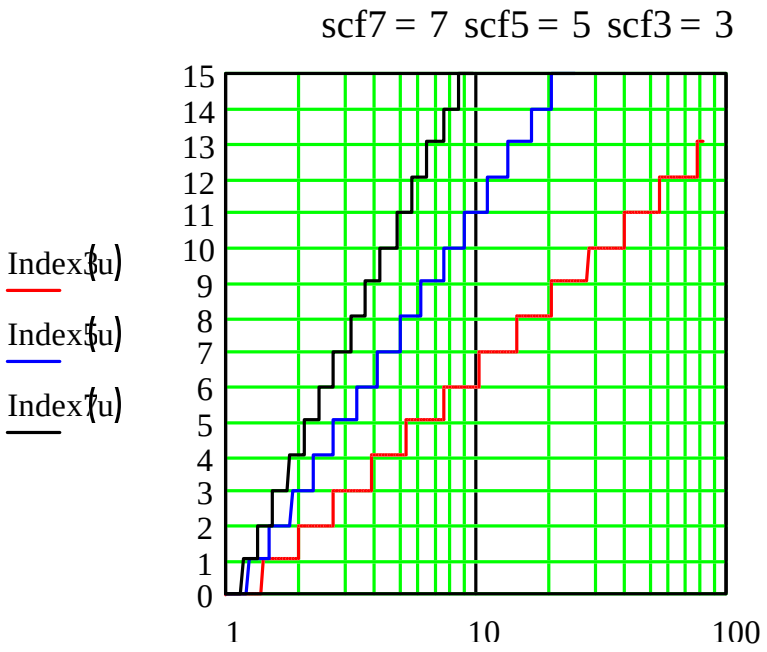
<<<<<<<Fo scf5 = 5 >>>>>>>>

Index Range from l		to k	Uncertainty Range from r_k	to R_k
0	to	1	0.0	0.92
1	to	2	0.92	1.12
2	to	3	1.12	1.37
3	to	4	1.37	1.67
4	to	5	1.67	2.04
5	to	6	2.04	2.49
6	to	7	2.49	3.04
7	to	8	3.04	3.71
8	to	9	3.71	4.54
9	to	10	4.54	5.54
10	to	11	5.54	6.77
11	to	12	6.77	8.27
12	to	13	8.27	10.1
13	to	14	10.1	12.33
14	to	15	12.33	>12.33

Uncertainty Scaling Index for Bands 22-30 and 33-36

For Bands 22-30 and 33-36, with

Specified Uncertainty at $Lty_{su} = 1$ %



1 sigma Uncertainty (%) versus 4 bit scaling index for three scaling factors

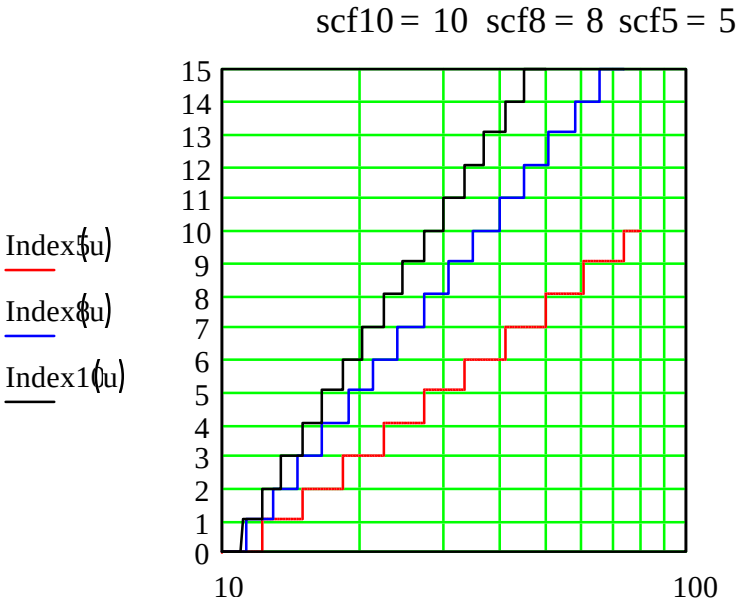
<<<<<<<Fo$scf5 = 5$ >>>>>>>>

Index Range from l		to k	Uncertainty Range from r_k	to R_k
0	to	1	0.0	1.22
1	to	2	1.22	1.49
2	to	3	1.49	1.82
3	to	4	1.82	2.23
4	to	5	2.23	2.72
5	to	6	2.72	3.32
6	to	7	3.32	4.06
7	to	8	4.06	4.95
8	to	9	4.95	6.05
9	to	10	6.05	7.39
10	to	11	7.39	9.02
11	to	12	9.02	11.02
12	to	13	11.02	13.46
13	to	14	13.46	16.44
14	to	15	16.44	>12.33

Uncertainty Scaling Index for Band 21

For Band 21, with

Specified Uncertainty at L_{typ} $_{su}$ = 10 %



1 sigma Uncertainty (%) versus 4 bit scaling index for three scaling factors

<<<<<<<Fo scf10 = 10 >>>>>>>

Index Range from l			Uncertainty Range from r_k	to R_k
0	to	1	0.0	11.05
1	to	2	11.05	12.21
2	to	3	12.21	13.5
3	to	4	13.5	14.92
4	to	5	14.92	16.49
5	to	6	16.49	18.22
6	to	7	18.22	20.14
7	to	8	20.14	22.26
8	to	9	22.26	24.6
9	to	10	24.6	27.18
10	to	11	27.18	30.04
11	to	12	30.04	33.2
12	to	13	33.2	36.69
13	to	14	36.69	40.55
14	to	15	40.55	>40.55

L1B Quality Assurance Overview

- 9 Common Binary flags (valid values, zeros, saturated, missing, etc)
- 12 Reflectance Band Binary flags
- 11 Reflectance Band ratio values at granule/band/channel level
- 11 Thermal Band Binary flags
- 24 Thermal Band ratio values (similar to RSB)
- Key Binary flag counters reported each 24 hours (requires further development with DAAC)
- Strip charts of key QA values maintained from initiation through mission with automated tools
- MCST Validation Program consisting of 10 OAs, 19 CAs, and 19 VAs

Operational QA
L1B QA Daily Metrics

1) $QA_{RSB} = \dfrac{[\Sigma\ 3\sigma \text{ excedence daily } + \Sigma \text{ (Physical Parameter out - of - limits daily)}]_{\text{current day}}}{[\Sigma\ 3\sigma \text{ excedences daily } + \Sigma \text{ (Physical Parameters out - of - limits daily)}]_{\text{benchmark day}}} - 1$

(Nominally = 0.0)

Totaled for (TBR) Parameters

2) QA_{TEB} Similar to QA_{RSB}

(Nominally = 0.0)

3) $QA_{data} = \sum_{i=1}^{490 \text{ detectors}} \text{Bad Data } (DN_{-sv},\ DN_{-bb} \text{ and } DN_{-EV}) = 0 \text{ or } -1$

(Nominally = 0.0)

4) $QA_{errors} = \sum_{i=1}^{15} E_i \text{ (L1B Error Messages)}$

(Nominally = 0.0)

These summary QA metrics will be provided to MCST daily from the DAAC
in a Status Processing Report on L1B; Report may be published on Homepage (TBR)

Overview of L1B QA Products

- Metadata is divided into 5 types:
  - Core Metadata
    - QG1: Operation Mode--determine from telemetry.
  - Archive Metadata
    - QG2-QG5: Instrument Status Flags
  - Product Metadata
    - QG6-QG12:Product Status Flags
    - QG13-QG19: Granule Level Product Indexes
    - QT1-QT25: TEB QA Products
    - QR1-QR8: RSB QA Products

  - Swath (or Scan Level) Metadata
    - QS1-QS12: Scan Level Instrument Status Flags
  - SDS Metadata (or Pixel Level Metadata)
    - QP1: pixel missing, dead, saturated, or has a calibration failure.

Overview of L1B QA Products

- QT 1-12.Noise in each of the 12 BB thermistors,
  - VAR[T_bb_ith thermistor per granule] /VAR_prelaunch (from QA LUT) i=1-12
- QT 13. Noise in Average Blackbody Temperature
  - VAR[T_bb_ave per granule] /VAR_prelaunch (from QA LUT)
- QT 14. Noise in LWIR FPA temperature
  - VAR[T_LWIRfpa per granule] /VAR_prelaunch (from QA LUT)
- QT 15. Noise in MWIR FPA temperature
  - VAR[T_MWIRfpa per granule] /VAR_prelaunch (from QA LUT)
- QT 16. Noise in Scan Mirror Thermistor #1
  - VAR[T_sm1 per granule] /VAR_prelaunch (from QA LUT)
- QT 17. Noise in Scan Mirror Thermistor #2
  - VAR[T_sm2 per granule] /VAR_prelaunch (from QA LUT)
- QT 18. Noise in Scan Mirror Thermistor Average
  - VAR[T_sm_ave per granule]/VAR_prelaunch (from QA LUT)
- QT 19. Noise in Instrument Temperature
  - VAR[T_instru per granule] /VAR_prelaunch (from QA LUT)

Overview of L1B QA Products

- QT 20. Noise in ADC temperature
  - VAR[T_MWIRadc per granule] /VAR_prelaunch (from QA LUT)
- QT 21. Noise in ADC temperature
  - VAR[T_PVLWIRadc per granule] /VAR_prelaunch (from QA LUT)
- QT 22. Noise in Cavity Temperature
  - VAR[T_cav per granule] /VAR_prelaunch (from QA LUT)
- QT 23. Noise in individual detectors
  - NEdL per granule/NEdL prelaunch (for each detector)
- QT 24. Change in relative response of each detector
  - b1_ave per granule/a1_prelaunch (for each detector)
- QT 25. Discontinuities in linear gain b1 across granules (for each detector)
  - Let b1_scan = the linear gain term for the i_th scan, determined from the average of 12 OBC thermistors;
  - Let b1_ave = the 40 scan moving average value of b1_scan; then report as integer value:

    $(\max(b1\_ave) - \min(b1\_ave))^2/var(b1\_ave)/34.46$;
  - where 34.46 is the expected value of: $(\max(b1\_ave) - \min(b1\_ave))^2/var(b1\_ave)$

Overview of L1B Reflective Solar Band QA Products - I

- Metadata used to hold QA:
  - Core Metadata, *e.g.*
    - Operation Mode--determine from telemetry.
    - Science Quality Flag -- overall quality status of granule
  - Level 1B Product Granule Metadata and QA Metadata
    - Product Status Flags
    - Granule Level Product Indexes
    - TEB QA Products
    - ***RSB QA Products***
    - Instrument Status Flags
  - Swath Metadata (written for every scan)
    - Scan Level Instrument Status and QA Flags

Overview of L1B Reflective Solar Band QA Products - II

- Handling of bad individual data
  - Bad data flagged by setting to 1 the high-order bit of unsigned scaled integer representation of digital signal, dn*.
  - Criteria for bad data:
    - pixel missing in Level 1A input file
    - detector is dead (list of dead detectors input to level 1B as look-up table)
    - datum is saturated
    - calibration algorithm failure
- See file specifications for 250 m, 500 m and 1 km products for full descriptions
  - Available at http://mcstweb.gsfc.nasa.gov/product.html

L1B Reflective Solar Band QA in Product Granule Metadata

- % Valid EV Observations
- % Saturated data
- Noise in MWIR FPA temperature
  - VAR[T_MWIRfpa per granule] /VAR_prelaunch (from QA LUT)
- Noise in Instrument Temperature
  - VAR[T_instru per granule] /VAR_prelaunch (from QA LUT)
- Dead and noisy detector lists
  - Input as LUTs and written to products

L1B Reflective Solar Band QA in Product Swath Metadata

- QA Bit flag includes the following:
  - Space View data bad: cannot be used for electronic background level calculations for any reflective band
  - Black Body data bad: cannot be used for electronic background level calculations for any reflective band
  - Moon in Keep Out Box for any reflective band

Additional QA for Reflective Bands

- OBC file includes
  - Variances in Space View signals for all reflective detectors
  - Bit masks identifying outliers in Space View data for all reflective detectors

- Offline QA
  - Analysis of Solar Diffuser data will be done outside level 1B.

Back-up Charts

Section Divider

Operational Activities - I

PARTIAL LIST RELATED TO VALIDATION

OA-08 Space View Port Lunar measurements: This activity involves a monthly S/C roll to utilize the moon as a calibration source for long term stability and cross-calibration of MODIS.

OA-09 Solar Diffuser Yaw mapping: This activity involves a series of S/C yaws to characterize the Solar Diffuser (SD) reflectance calibration uncertainties, tests for scan cavity and SD Port edge scattering. Specifically, they separate changes in reflectance due to angular effects from temporal effects.

OA-10 Cold Space (Spacecraft Pitch) Maneuver for RVS: This activity measures the response versus scan angle (RVS) measurements for the MODIS thermal bands without the presence of the moon.

Operational Activities - II

PARTIAL LIST RELATED TO VALIDATION

OA-14 <u>Cavity Mapping with Sector Rotation</u>: This activity measures stray light characteristics of the scan cavity and is used to measure RVS and the thermal background of the cavity.

OA-17 <u>RVS Stability Monitoring via Sector Rotation</u>: This activity collects thermal data from a corner inside the cavity to provide a temperature data point, in addition to the measurements from the blackbody, with which to calibrate the thermal bands.

OA-18 <u>SDSM Charged Particle Background</u>: This activity monitors the amount of radiation from trapped particle fields that is penetrating the MODIS and SDSM shielding. This is performed in the SAA and high magnetic latitudes.

Operational Activities - III

PARTIAL LIST RELATED TO VALIDATION

OA-20 SRCA/Diurnal Short-term Radiometric Stability: This activity tracks intra-orbit variations of radiance values.

OA-22 SRCA Spectral Response Stability: This activity monitors changes to the center wavelength, bandwidth and spectral profiles of the reflective bands

OA-23, 24 SRCA Co-Registration and IFOV Stability: This activity tracks registration for each MODIS detector in the along-scan direction.

OA-26 Thermal Band Non-linearity Black body Warm-up and Cool-down: This activity performs a radiometric check on thermal band linearity by compiling radiance values for all thermal bands.

Selection of Early On-Orbit Characterization Activities - I

CA-01 Trending of Reflectance Calibration: This activity provides comparison and continuous trending of Esun*SD_BRDF/L_SIS compared to pre-launch solar diffuser and SIS100 calibrations

CA-02 SD SNR study: This activity considers benchmark comparisons and trending of pre-launch and on-orbit noise figures of merit for solar diffuser measurements

CA-03 Temperature sensitivity of SD observations: This study will investigate impact of sensor temperature variability on SD observations over seasonal illumination and temperature

CA-04 Band 7 SD BRF: SBRS B7 calibration of solar diffuser not valid. This activity will obtain needed measurements from NIST of "TIS" so as existing SBRS SD BRF data set can be extrapolated to Band 7 values

CA-05 SDSM charged particle effects: Perform SDSM SiPD studies during Terra transitions through SAA and north polar magnetic horn regions

Selection of Early On-Orbit Characterization Activities - II

CA-06 SWIR bands thermal leak: Current code includes a correction for thermal leaks into the SWIR bands. Night-time SWIR data will be used to validate/improve this correction

CA-07 Establish Space View moon KOB: Determine uncontaminated data limits (Keep out box) for lunar approach to Space View Port (to be used in L1B LUT)

CA-08 Optical and spatial purity studies: This activity will develop and implement techniques to look for optical ghosting, OOB, optical and electronic cross-talk effects using spatially displaced ghost images

CA-09 RSB RVS: Use full scan range histogram equalization studies to validate RSB RVS LUTs

CA-10 RSB destriping, cavity contamination and residual polarization effects: Using full scan range histogram equalization studies validate full scan and track direction destriping, potential spurious cavity reflection correction, and residual polarization effects on RVS in LUTs

Selection of Early On-Orbit Characterization Activities - III

CA-11 Cloud edge transient response: Investigate usefulness of high contrast scenes such as Broad Ocean Area (BOA) with semi-infinite cold front cloud formation (sharp edge contrast) for scatter measurements and image scatter ghosting investigations and for testing instrument scatter characteristics

CA-12 Shore line transient response: Investigate usefulness of low to moderate contrast scenes such as long coastline scatter measurements and image scatter characterization for scatter measurements and image scatter ghosting investigations and for testing instrument scatter characteristics (much lower contrast than bright clouds over dark ocean, but useful to validate PFM scatter coefficients, used to validate and extend PSF model)

CA-13 Scene Restoration studies: Develop and demonstrate MCST FFT Scene Restoration algorithm, include far-field scatter effects beyond conventional 5 X 5 pixel PSF kernal approaches

CA-14 TDI effectiveness: Verify TDI Band 13/13' and Band 14/14' SNR characterizations

Selection of Early On-Orbit Characterization Activities - IV

CA-15 Bands 31 cross-talk: Validate cross-talk reduction algorithm for light leak from Band 31 into Bands 32 - 36, look for residual spatially displaced shadow-like effects

CA-16 TEB NEdT/SNR study: This activity considers benchmark comparisons and trending of pre-launch and on-orbit noise figures of merit for thermal emissive bands measurements

CA-17 Test sites trending: Trending of sensor response over selected instrument sites, usually for sites not instrumented or surveyed

CA-18 SDSM screen signal ripple and vignetting factor: Investigate signal variation over periods of several seconds in SDSM response due to screen hole modulation and vignetting by the SDSM screen

CA-19 SD Screen Transmission: Verify the SD screen transmission matches expected values; look for transient response effects from bright SD source in scan cavity

Vicarious Validation Activities - I

Surface-based Measurements

VA-01 U of Az/Railroad Playa

VA-02 NOAA/MOBY

VA-03 DOE/ARM

VA-04 Oceans Team/Validation Cruises

VA-05 U Miami/In-situ Studies, Commercial cruise lines

Vicarious Validation Activities - II

Surface-based Measurements (cont.)

VA-06 Ocean Temperature Buoy Network

VA-07 Antarctica/RVS

VA-08 NSF/LTER

VA-09 UCSB/Railroad Playa

Vicarious Validation Activities - III

Aircraft and Underflights

VA-10 U Wisc/HIS

VA-11 GSFC-Wisc/MAS

VA-12 GSFC/P. Abel

Other Activities

VA-13 USGS/Lunar Radiance

Vicarious Validation Activities - IV

Satellite Cross-calibrations

VA-14 AVHRR

VA-15 AATSR

VA-16 MISR

VA-17 ASTER

VA-18 GLI

VA-19 MODIS-PM